

# An Analysis of Recreational Fishers' Activities and Attitudes at *Gray's Reef National Marine Sanctuary*



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This paper resulted from a pilot survey of attitudes and behaviors of Georgia recreational fishermen in Gray's Reef National Marine Sanctuary administered in April, 2001. There were a total of 60 respondents from the Southern Kingfish Association's Georgia membership. The response rate was 91 percent. The results indicate that the majority of our respondents targeted King Mackerel by trolling and have fished the reef for an average of 11 years. The majority of the respondents indicated that current regulations are fair and that there should not be any change in enforcement. The greater part of our respondents also indicated that the majority of their fishing activity takes place in the mid-water environment as opposed to the bottom habitat. We hope that the findings from this study will provide sanctuary managers useful information about user behavior in this national treasure.

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## Background and Problem Statement

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Gray's Reef National Marine Sanctuary is one of the largest near shore live-bottom reefs off the southeastern United States. The sanctuary is located 17.5 miles off the coast of Georgia and encompasses 17 square miles of live-bottom habitat. The reef supports a wide variety of marine flora and fauna and attracts many species of benthic and pelagic fish including Black Sea Bass, other grouper species, snapper, and mackerel. Due to the unique location of the reef between temperate and tropical waters, many fish species migrate through the sanctuary.

Gray's Reef is a popular location for recreational fishing and SCUBA diving. Recreational fishing occurs year-round, but commercial fishing, military activities, mineral extraction, and ocean dumping activities are restricted. The current regulations prohibit alteration of the seabed; use of wire fish traps, bottom trawls, and explosives; damage to or removal of bottom formations and other natural or cultural resources; and discharge of substances or materials. These regulations



are enforced through an interagency agreement between the U.S. Coast Guard and the National Marine Fisheries Enforcement Division (Gray's Reef website).

Our research team was interested in looking at public opinion and perceptions of Marine Protected Areas so we contacted the Gray's Reef Sanctuary management to see if this type of survey was of interest to them. The Sanctuary staff was very interested in having us conduct a survey about Gray's Reef, but they were more interested in obtaining information on the type of fishing activity and fishing intensity at the reef. The sanctuary is currently revising its five-year management plan and this data could provide useful information to help with the plan revision. Based on discussions with Gray's Reef staff, the research team developed the following research questions:

- What types of recreational fishing activities are occurring on Gray's Reef?
- How intense is that fishing activity?
- What are the attitudes of recreational fishermen on Gray's Reef towards current and potential future sanctuary regulations?

## Methods and Procedures

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### Development of the Survey Instrument

The sanctuary management (NOAA) enthusiastically supported our plan to perform a survey with users of the Gray's Reef area and provided useful input regarding the content of the survey instrument. We implemented our survey through telephone interviews because an in person survey was not feasible, a mail survey would take too long, and an electronic survey would minimize the size of our survey. Before producing the first draft of our questionnaire two members of our research team met with Becky Shortland, the Sanctuary's outreach coordinator, to identify important issues to be investigated. Ms. Shortland provided us with some useful documents regarding sanctuary management plans and regulations (NOAA, 2000). We then composed the first draft of our survey questionnaire. We developed five different categories of questions which aimed to answer our larger research questions. These were: 1) Fishing intensity and preference, 2) Targeted species, 3) Boat modes and gear use, 4) Awareness of and opinions about regulations, and 5) Demographic questions.

After presenting the questionnaire in class and making several alterations based on the critiques from our fellow students we faxed a copy to the sanctuary managers. We then participated in a conference call with Ms. Shortland, Rod Ehler, and Bob Leeworthy, the latter two being economists with NOAA who had previously performed a socioeconomic analysis of marine industries and activities on Gray's Reef National Marine Sanctuary (Ehler, 2001). They provided useful comments on important issues we had not addressed in the survey such as time spent on the actual reef, number of people on the fishing boats, and fishing methods. They also pointed out specific questions that would not provide useful or reliable information such as "What is the average weight of the fish that you catch?" and "Do you own the gear that you use while at Gray's Reef?" After adapting the questionnaire to include these elements we were ready to perform a focus group meeting.

## The Focus Group

We decided to search for focus group participants within local (North Carolina) recreational fishing clubs and found an announcement for a meeting of the Raleigh Saltwater Fishermen's Club on the organization's website. Two members of our research team attended the meeting in an attempt to recruit focus group participants. An announcement was made during the meeting and about 15 members expressed their willingness to participate in a focus group discussion. Upon contacting these members, nine were available to attend the meeting on the evening scheduled. Based on our prepared script (Appendix C), one member of our team conducted the meeting while two members took notes.

After obtaining participant consent we held the meeting in a meeting room of a local restaurant. The participants were very enthusiastic and provided some very useful information that helped us to better understand the offshore recreational fisherman. One of the participants had actually fished at Gray's Reef before and was thus able to provide some first hand knowledge of the area. Each question of the survey was examined for clarity and for what might be possible answers. Specifically the participants were able to help us in regards to the different types of gear used by recreational fishers, familiarity with different levels of fishing regulations (state, federal), the best time to make interview phone calls, and whether or not specific questions were understandable and answerable. We added more answer options to several questions and attempted to clarify others.

## Locating a Sample Population

The sanctuary managers expressed that the Georgia membership of the Coastal Conservation Association (CCA) would make an excellent survey sample group considering that many of them were recreational fishers who were likely to have fished on Gray's Reef. When NOAA originally contacted the president of CCA he stated that they would be willing to participate in the survey. However, when we attempted to retrieve the phone numbers of the CCA's Georgia members, we were informed that the phone numbers could not be released due to a possible breach of confidentiality of CCA's members. We were offered e-mail addresses instead, but at that point it was too late to consider a transformation of our telephone survey into an e-mail or internet survey. In an attempt to locate a different sample population, NOAA put us in contact with the Southern Kingfish Association (SKA). Sam White of SKA was immediately interested in our survey and within two days sent us a list of phone numbers for SKA's Georgia membership. An announcement was also posted on the SKA website encouraging members to participate in the survey.

## Pretest and Survey Implementation

Prior to the pretest we submitted the survey for review by the Institutional Review Board at Duke's Office of Research Support. After approval we performed a pretest of five phone interviews using the SKA Georgia membership database. Following the pretest, answer categories were coded to allow for easier data entry and analysis (Appendix B). From Monday the ninth of April through Monday the sixteenth, the telephone interviews were performed. Each member of the research team performed 12 interviews for a total of 60 completed questionnaires. The respondents were contacted between 7:00 and 8:30 on weeknights (three surveys were done during the day) and from 3:00 in the afternoon until 8:00 in the evening on weekends using a randomized list of SKA telephone numbers. Upon completion of the 30 survey questions, respondents were given a chance to offer any additional comments (Appendix E).

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## Error Structure

In reporting the results of our survey, it is important to analyze the possible sources of error that may be present. The largest potential source of error is our sample group, the Southern

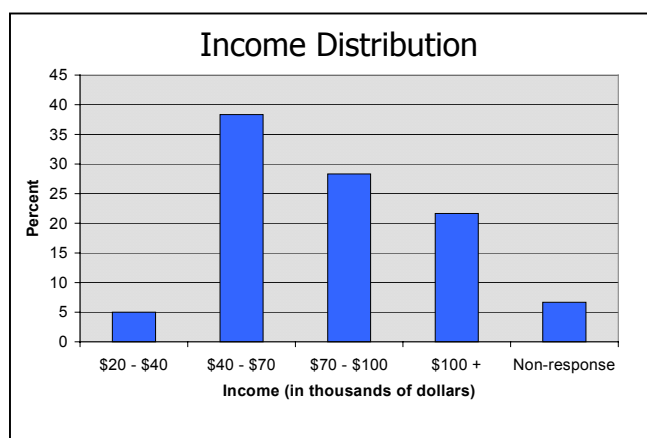
Kingfish Association. SKA is not necessarily representative of the population of fishers on Gray's Reef, mainly because people who choose to join the association are generally men who are interested in tournament fishing or recreational fishing for King Mackerel. They primarily travel in private boats and have relatively high incomes. We do not know if this is representative of other fishers on Gray's Reef.

A second source of error could be in our response group. Our response rate was quite high (91 percent). However, in our calculation we did not include calls that were not answered or were picked up by answering machines. Through caller ID and answering machines, certain respondents could have screened their calls. We also made the majority of our calls at night and, therefore, could have missed the sector of the population that is more accessible during the day. However, we believe that the characteristics of these groups of potential respondents do not differ significantly from the actual respondents.

A third potential source of error is in our sample size. This is a pilot study so we only used a sample size of sixty people out of 469 possible respondents. With a confidence level of 95 percent, our margin of error was 0.12. To have a confidence level of 95 percent and a more acceptable margin of error of 0.05, our sample size would need to be 212. While this study provides a good indication of general trends, further studies are needed to draw more significant conclusions about the larger population of Gray's Reef fishers.

## Demographics

All of the respondents in this survey were recreational fishers and one respondent was both a recreational and commercial fisherman. The median age range of the fishers was 36–45, while the median income range was \$70,000 – \$100,000. Just under 40 percent of our respondents were in the \$40,000 – \$69,999 range. (This higher than the results of a southeast marine angler survey which reported about 21 percent of respondents in the \$35,999–60,000 [1997 MRFSS Survey]). Respondents have been fishing at Gray's Reef an average of 11.4 years and a median of 9 years (min = 1, max = 30). Graphs on age and fishing experience on Gray's Reef can be found in Appendix F (Figures F4 and F7).



The survey findings can be summarized according to the following five categories: fishing intensity and preference, species, boat mode and gear use, regulations, and demographics.

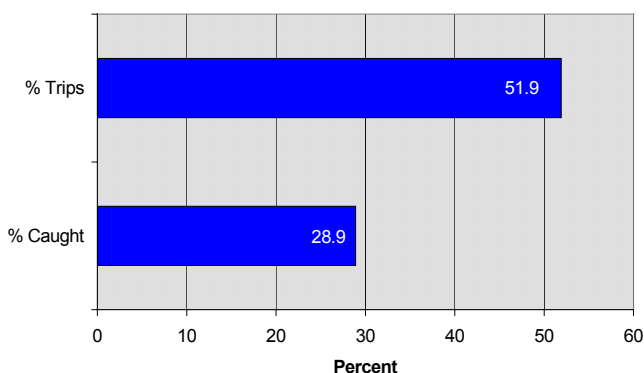
### Fishing Intensity and Preference

The purpose of this section of the survey was to quantify the intensity of fishing activity on Gray's Reef by the survey population, when this activity was greatest, and why this group chose Gray's Reef National Marine Sanctuary over other fishing areas. In order to quantify the intensity of fishing effort, respondents were asked the total number of fishing trips they had taken off the coast of Georgia in 2000 and the number of these trips that were at Gray's Reef.

They were also asked the total number of saltwater fish caught in 2000, and the number of these fish caught at Gray's Reef (excluding bait-fish). Figure 1 shows the average percent of respondents' total fishing activity taking place on Gray's Reef in the year 2000. Fifty-two percent ( $n = 55$ ,  $SD = 26.9$ ) of the average total saltwater fishing trips were trips to Gray's Reef, suggesting that the reef is a preferred fishing location. Twenty-nine percent ( $n = 49$ ,  $n = 25.7$ ) of the average total catch was from Gray's Reef.

Fishing intensity was also measured by season and the majority of trips took place during the spring, summer, and fall. The peak season for fishing trips to the reef was the summer, with 97 percent of those surveyed responding that at least some of their fishing trips during 2000 took place during the summer (Figure 2).

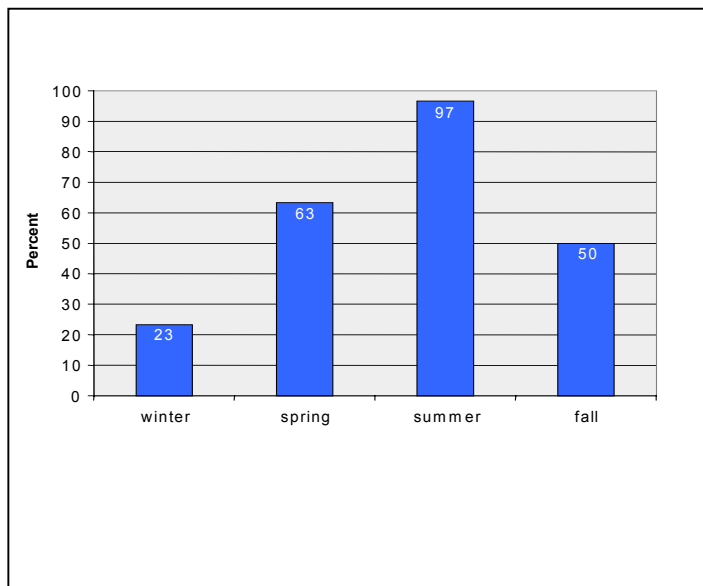
**Figure 1. Percent of Total Fishing Activity Spent at Gray's Reef**



*Percent of respondent's fishing activity taking place at Gray's Reef versus all other saltwater fishing locations. Note the difference between percent of total fishing trips taken and percent of total fish caught. Figure represents trips and catch for 2000.*



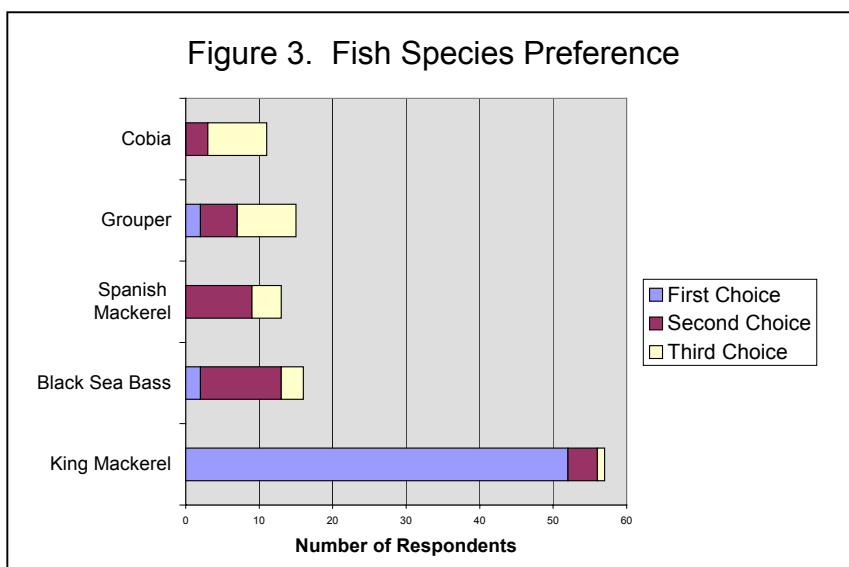
In order to assess why respondents were fishing Gray's Reef, they were asked if they fished for food, for recreation, because of family tradition, or because of tournaments taking place at the reef. (Respondents could choose more than one answer.) Fifty-seven percent of respondents replied that they fished the reef for recreation, while forty-seven percent fished there because of tournament fishing opportunities. Very few respondents (12 percent) replied that they fished the reef because of family tradition (Appendix F, Figure F6).



The median number of fishers on each of the respondents' boats was 3.6, suggesting that these users are fishing from relatively small watercraft. The median number of trips taken to the reef in 2000 by SKA members surveyed was six, with a minimum of two and a maximum of 80 trips. We can deduce that a typical SKA fisher might take 12 saltwater fishing trips per year, with six to Gray's Reef (probably during Kingfish tournaments). Fifteen percent of the surveyed population had participated in SCUBA diving on the reef.

## Species

To get an idea of which fish species were targeted by recreational fishers on Gray's Reef, we asked respondents to identify target and non-target species caught as well as which species were caught the most frequently. As can be seen in figure 3, the vast majority of respondents' first choice was King Mackerel, followed by Black Sea Bass and other grouper species.



Since our survey population was SKA, it is not



surprising that the respondents' first choice is King Mackerel. However biased, these results can still give us a good idea of some of the other frequently encountered, though not targeted, fish species. The only fish mentioned as first, second, or third choice target fish were Cobia, grouper, Spanish Mackerel, Black Sea Bass, and King Mackerel. Fish that were caught as unintentional by-catch included barracuda (reported by 72 percent of the respondents), shark (reported by 40 percent of respondents), Bonita, Amberjack, Spanish Mackerel, Cobia and several others (Appendix F, Table F1). Since we just asked for examples, these findings are only suggestive of species presence and abundance at Gray's Reef.

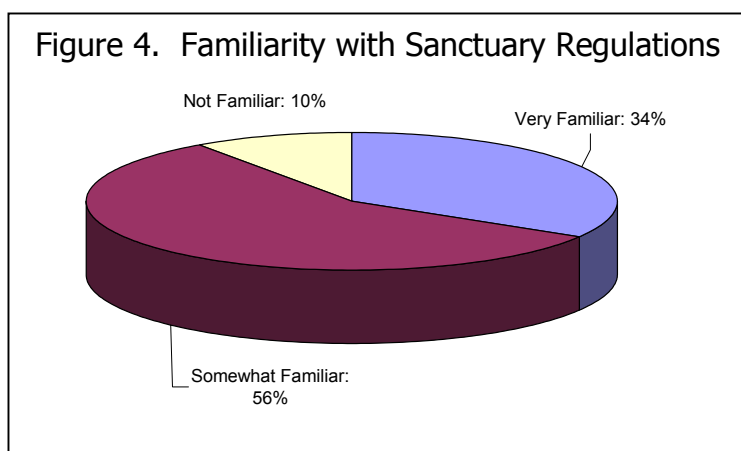
### Boat Mode and Gear Use

Respondents were asked if they traveled to the reef by a private boat (owned by themselves or a friend), charter boat (6 people or less where the individuals came together to hire a charter boat), or by a party boat (usually 25 – 100 people who pay per head). All of the individuals surveyed, of which two were charter boat captains, traveled via private boat. The charter boat captains were categorized as traveling via “private boat” because they owned the boat themselves. One-hundred percent of respondents indicated that they use rod and reel and trolling lines, with two reporting the use of nets to catch bait. Over 50 percent of our respondents use only trolling as a fishing method, while about a quarter anchor up to 25 percent of the time. Fifteen percent of the respondents SCUBA dive in the reef as well (mean number of times diving in 2000 is 7) and 44 percent of these individuals spearfish while diving.

### Regulations

To understand the views of recreational fishermen on rules and regulations for Gray's Reef, we asked a variety of opinion questions. The majority of respondents (56 percent) considered themselves somewhat familiar with the current sanctuary regulations (Figure 4).

Seventy-four percent of the respondents who are somewhat or very familiar with the regulations think the current sanctuary regulations are fair (Appendix F, Figure F1). The 12 percent that think they are not fair included



reasons such as the regulations are too narrow-minded, catch limits are too low, and spearfishing should be banned. The majority (56 percent) of the respondents think there should be no change in the enforcement of the regulations (Figure 5). Most respondents (78 percent) would report someone in violation of the sanctuary regulation (Figure 6). Five percent replied that it would depend on the severity of the violation. Statistical tests showed that opinions on enforcement were not dependent on age (Chi-square test,  $p$ -value = 0.55, Appendix F, Table F2) or percent of fish caught on the reef ( $p$ -value = 0.27).

Figure 5. Enforcement of Regulations: More, Less, or the Same?

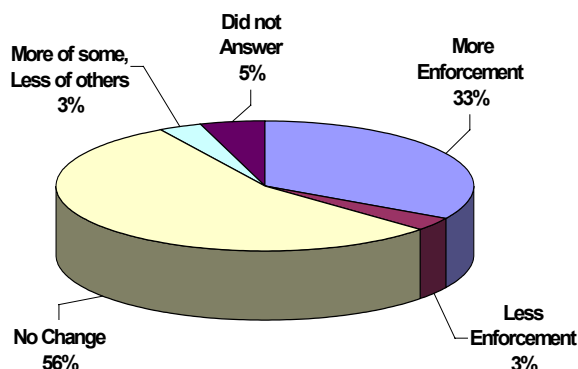
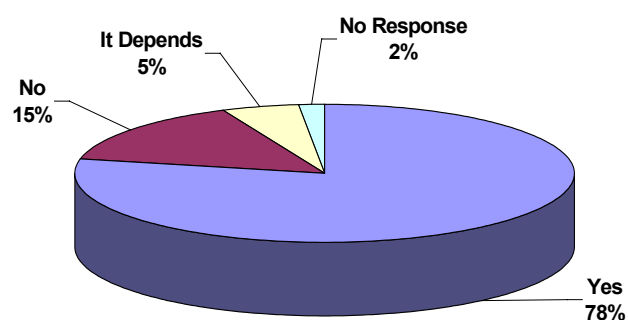


Figure 6. Would you report someone in violation of sanctuary regulations?



### Respondents' Concluding Remarks

In an attempt to gather any important information on the respondents' opinions and attitudes, an open-ended question was included at the end of the survey asking respondents to provide any additional comments regarding Gray's Reef. Of those individuals who provided additional comments ( $n = 45$ ), 62 percent stated that the reef should not be closed, 18 percent mentioned anchoring as an issue, 18 percent consider commercial regulations to be an issue, and 16 percent said that there should be more enforcement of existing regulations. All of these responses are provided in Appendix E.

The survey was conducted with 13 percent of the SKA Georgia membership. This being the case, it is important to note that the conclusions and implications should be seen as part of a pilot study. Caution should be used when drawing inferences about the general recreational fishing population and their activities in Gray's Reef National Marine Sanctuary from these results.

### The Living Reef

Gray's Reef was designated a National Marine Sanctuary because it was recognized as a national treasure. As such, the research questions of the survey focused on how this resource was being used and to see if the current activities are compatible with sustaining the resource. A key component of the sanctuary is the living reef itself. Although the majority of our respondents' activities take place above the reef (see Findings section), a significant amount of activity takes place close to the reef. Black Sea Bass and other grouper species, both bottom dwelling reef fish dependent on the reef structure for habitat, were listed by about half of the 60 respondents as their top three target species. The fact that 15 percent of the 45 fishermen who answered the final opinion question chose to discuss "anchoring on the reef" indicates that Gray's Reef users are aware that damage to the reef from anchoring is a concern. Furthermore, 15 percent of all respondents SCUBA dive on the reef, a direct though not always consumptive use of the reef. Some uses of the reef such as bottom fishing and SCUBA may require anchoring in order to secure the boat to the reef. This anchoring often breaks off coral and dislodges other organisms from the reef. The resulting damage is not compatible with current management goals that are to protect the living reef. There are at least two management options which could prevent anchor-damage to the reef. One option is to enforce a "no anchoring rule" over the entire reef or parts of it, while another perhaps more preferable option is to fasten permanent mooring buoys to the reef. As monitoring and enforcement are always difficult, the second option might make more sense. Problems that could arise from mooring buoys are where to allocate them throughout the sanctuary and how to allocate them amongst the various user groups such as bottom-fishermen and SCUBA divers.

Our survey indicated that only about one-quarter of the respondents anchored in the sanctuary (usually less than 50 percent of the time). We also found that half of the fishers rank

bottom-fish among their most preferred species. Since there are alternatives to anchoring for both SCUBA divers and bottom-fishers, these variables should not be used as indicators of anchoring frequency. Further research should investigate the full extent of pressures on bottom habitat from both SCUBA divers and boat fishermen in order to recommend management options for preserving this important habitat while allowing for the aforementioned activities to continue in a sustainable fashion.

## The Mid-Water Environment

The SKA members were concerned about being able to continue fishing strong-swimming mid-water fish species. Ninety-five percent of the respondents indicated King Mackerel as one of their top three target species. For many of the SKA members, fishing King Mackerel is the only reason for making the journey to Gray's reef.

Seventy-four percent of the respondents said that the current regulations are fair and at least two respondents mentioned that they would not be adverse to stricter catch limits. Also, while over half of the respondents thought there should be no change in enforcement, 33 percent stated that enforcement of current regulations should be increased. When taking these responses into consideration, one could reasonably argue that more stringent regulations, or greater enforcement of current regulations would be more readily accepted than the establishment of "no-take" type regulations. This study also revealed various species of non-target catch (Table F1). Further studies could investigate by-catch mortality rates so that prevalent by-catch species such as barracuda and sharks could be managed taking this factor into consideration.

## Fishing Time and Catches on Gray's Reef vs. Outside the Reef

Respondents' dependence on Gray's Reef as a recreational fishing area can be determined by quantifying the amount of time spent on Gray's Reef as compared to other fishing locations. Fifty-two percent of respondents combined total fishing time was spent in the sanctuary. This indicates that Gray's Reef is an important component of the respondents' total fishing activity. Some fishers only fish in tournaments, which are often held in the sanctuary. In these cases it may be the tournament, not the reef itself, which is attracting fishers. It may be assumed, however, that the tournaments are located in the Sanctuary because of species abundance on the reef. A further study could attempt to capture the percentage of people using Gray's Reef solely

for tournaments. Results could help determine if the tournaments should contribute financially to the Sanctuary in order to sustain the resources on which they depend.

Based on the high degree of fishing effort (trips) in Gray's Reef, one would expect the respondent's catch to be greater in the sanctuary. The survey actually shows that only about 30 percent of respondents' total catch is from the sanctuary. This most probably reflects that targeted species within the sanctuary may differ from those targeted in other fishing locations and the fishing method changes for the species type.

## Recommendations

- Dissemination of information to and communication with the various user groups of the Gray's Reef area would help to strengthen confidence in and support for management decisions.
- A portion of tournament fees could be earmarked for sanctuary upkeep to provide funding for further research, monitoring efforts, and improved enforcement. Fees could also be charged to other large-scale user groups, such as commercial fishers and dive operators.
- Installation of mooring buoys on the reef could provide an alternative to anchoring. If buoys already exist, an effort should be made to promote their use.
- Further studies surveying user groups such as SCUBA divers and other recreational and commercial fishers should be performed. These would provide more information regarding the intensity of fishing pressures to the reef habitat and optimal locations for buoy placement.

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- <http://www.graysreef.nos.noaa.gov>
- Personal Communication from the National Marine Fisheries Service Fisheries Statistics and Economics Division, 1997 MRFSS Survey.

# Appendixes



## Appendix A

### Survey Questionnaire

#### Introduction

Good evening (afternoon/morning), is Mr./Ms. \_\_\_\_\_ there?

Hi. My name is \_\_\_\_\_. I am a Duke University graduate student conducting a survey of fishermen who fish in Gray's Reef National Marine Sanctuary. We got your name through the Southern Kingfish Association and would appreciate your participation in this survey. Do you fish at Gray's Reef? (if yes continue, if no, say thank you for your time) We're very interested in learning the opinions and concerns of the fishermen who use Gray's Reef. There are no correct or incorrect responses, so please feel free to express your opinions. You are free to skip any questions. I can guarantee that the answers you give me will be confidential – in no way will the information you provide me be connected with your name. Would you mind taking about 15 minutes of your time to answer some questions?

#### ***FISHING INTENSITY AND PREFERENCE QUESTIONS***

1. What type of fisherman are you?
  - ☐ Commercial
  - ☐ Recreational
  - ☐ Both
2. During what time of year do you fish the most?
  - ☐ Winter
  - ☐ Spring
  - ☐ Summer
  - ☐ Fall
  - ☐ No preference
3. How many fishing trips did you take off of the coast of Georgia in the year 2000?  
OPEN ENDED
4. How many fishing trips did you take to the Gray's Reef area in the year 2000?
  - ☐ OPEN ENDED
5. On your trips to Gray's Reef, how many hours do you usually spend on the reef?
  - ☐ 1 – 3 hours
  - ☐ 4 – 7 hours
  - ☐ 8 – 12 hours
  - ☐ Other (specify)

6. Do you tend to fish in only one location, or in several locations at Gray's Reef?
  - One
  - Several
  
7. Do any of the following factors influence your choice of fishing locations at Gray's Reef?
  - Weather YES/ SOMEWHAT/ NOT AT ALL
  - Word of mouth/radio talk YES/ SOMEWHAT/ NOT AT ALL
  - Seasonal patterns YES/ SOMEWHAT/ NOT AT ALL
  - Captain's choice YES/ SOMEWHAT/ NOT AT ALL
  - Fish species preference YES/ SOMEWHAT/ NOT AT ALL
  - Time of day YES/ SOMEWHAT/ NOT AT ALL
  - Other DESCRIBE
  
8. Why do you fish Gray's Reef?
  - For food YES/ NO
  - For recreation YES/ NO
  - For family tradition YES/ NO
  - Tournament prizes YES/ NO
  - For Other (describe)
  
9. How many fish did you catch at Gray's Reef in the year 2000?
  - OPEN ENDED
  
10. About how many of these fish did you keep?
  - OPEN ENDED
  
11. How many fish did you catch in total for the year 2000? This is not just at Gray's Reef.

## SPECIES QUESTIONS

12. Of **all** species, which do you catch the most frequently on Gray's Reef?
  - OPEN ENDED
  
13. What are your top three target species at Gray's Reef? Rank them, most favorite species first.
  
14. What are some examples of your non-target catch?

## BOAT MODE/GEAR USE QUESTIONS

15. What type of gear do you use when fishing? *(interviewer will check all that apply)*

- ☐ Rod and reel (Types...fly, etc.)
- ☐ Nets (Types)
- ☐ Spear-gun
- ☐ Hawaiian sling
- ☐ Fish-finding equipment
- ☐ Trolling lines (Down rigger, Outrigger)
- ☐ Hand lines
- ☐ Other (Describe)

16. When you go on fishing trips, which of the following methods do you usually travel by?

For each one answer 0, 25, 50, 75, or 100%.

Private household boat *(owned by you or a friend)*

0%	25%	50%	75%	100%
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Charter boat *(6 people or less for day, everyone knows each other)*

0%	25%	50%	75%	100%
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Party boat *(about 25-100 people, pay per head) (if party boat, skip to 18)*

0%	25%	50%	75%	100%
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Rental

0%	25%	50%	75%	100%
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Other

17. In general, how many people do you fish with on your trip to Gray's Reef?

18. In general, how many of these people belong to a fishing group or association? Of these, how many belong to the Southern Kingfish Association?

19. When fishing at Gray's Reef, how often do you use the following fishing methods? For each one answer 0, 25, 50, 75, or 100%.

Troll	0%	25%	50%	75%	100%
Anchor	0%	25%	50%	75%	100%
Drift	0%	25%	50%	75%	100%
Other	0%	25%	50%	75%	100%

20. Do you ever SCUBA dive at Gray's Reef? *(if no, proceed to question 20)*

If so, about how many times per year?

Do you spear fish when SCUBA diving?

## REGULATION QUESTIONS

We are down to the last 10 questions.

21. How would you rank your familiarity with the fishing rules and regulations in place at Gray's Reef?
  - ☐ Very familiar
  - ☐ Somewhat familiar
  - ☐ I am not familiar with any of the rules or regulations
22. How did you learn about the regulations?
  - ☐ Read about in publications (*interviewer can ask which one*)
  - ☐ Heard from boat captain
  - ☐ From other fishermen
  - ☐ Tackle shop
  - ☐ Internet
  - ☐ Other (describe)
23. Do you bring a copy of the Gray's Reef regulations with you on the boat?
  - ☐ Yes
  - ☐ No
24. Do you bring a copy of general fishing regulations with you on the boat?
  - ☐ Yes
  - ☐ No
25. Do you think the sanctuary regulations are fair?
  - ☐ Yes
  - ☐ No
    - If no, which regulations do you think are unfair?
26. Would you report someone in violation of the regulations?
  - ☐ Yes
  - ☐ No
27. Do you think there should be more/less/no change in enforcement of the regulations?
  - ☐ More
  - ☐ Less
  - ☐ No Change

## DEMOGRAPHIC QUESTIONS

28. How many years have you been fishing the Gray's Reef area?
- ☐ OPEN ENDED
29. Which of the following categories best describes your age?
- ☐ 18 – 25
  - ☐ 26 – 35
  - ☐ 36 – 45
  - ☐ 46 – 55
  - ☐ 56 – 65
  - ☐ 66 and above
30. Which category best describes the annual income of your household?
- ☐ \$0 to \$10,000
  - ☐ \$10,001 to \$20,000
  - ☐ \$20,001 to \$40,000
  - ☐ \$40,001 to \$70,000
  - ☐ \$70,001 to \$100,000
  - ☐ Above \$100,000
31. Do you have any comments or thoughts about Gray's Reef Sanctuary that were not covered in this survey?

## Appendix B Coding Instructions

1. TYPE	1 = Commercial, 2 = Recreational, 3 = Both
2. SEASON	1 = Winter, 2 = Spring, 3 = Summer, 4 = Fall, 5 = All Seasons, 6 = Spring through Fall, 7 = Fall and Spring, 8 = Spring and Summer, 9 = No Preference
3. TRIPS 2000	open
4. TRIPS GRAY	open
5. HOURS	1 = 1–3 hours, 2 = 4–7 hours, 3 = 8 – 12, 4 = Other
6. LOCATION	1 = One, 2 = Several
7.1 WEATHER	Yes = 1, Somewhat = 2, Not at All = 3
7.2 C_WORD	Yes = 1, Somewhat = 2, Not at All = 3
7.3 C_SEASON	Yes = 1, Somewhat = 2, Not at All = 3
7.4 C_CAPTAIN	Yes = 1, Somewhat = 2, Not at All = 3
7.4 C_SPECIES	Yes = 1, Somewhat = 2, Not at All = 3
7.5 C_TIME	Yes = 1, Somewhat = 2, Not at All = 3
7.6 C_OTHER	Yes = 1, Somewhat = 2, Not at All = 3
8.1 WHY FOOD	1 = yes, 2 = no
8.2 WHY REC	1 = yes, 2 = no
8.3 WHY FAM	1 = yes, 2 = no
8.4 WHY PRIZE	1 = yes, 2 = no
8.5 WHY OTHER	open
9. NUM REEF	open
10. NUM TOTAL	open
11. KEEP	open
12. FREQUENT	open

13. 3 TARGET	open
14. NON-TARGET	open
15. GEAR	1 = Rod and reel, 2 = nets, 3 = spear, 4 = hawaiian, 5 = fish finding, 6 = trolling, 7 = hand lines, 8 = other
16.1 PRIVATE	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
16.2 CHARTER	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
16.3 PARTY	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
16.4 RENTAL	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
16.5 COMBO	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
16.6 OTHER	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
17. PEOPLE	open
18.1 GROUP	open
18.2 SKA	open
19.1 TROLL	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
19.2 ANCHOR	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
19.3 DRIFT	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
19.4 OTHER	1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%
20.1 SCUBA	1 = yes, 2 = no
20.2 S_TIMES	open
20.3 S_SPEAR	1 = yes, 2 = no
21. R_FAMILIAR	1 = very, 2 = somewhat, 3 = not
22. R_LEARN	1 = publications, 2 = captain, 3 = fishermen, 4 = shop, 5 = internet, 6 = other
23. R_BRING_G	1 = yes, 2 = no, 3 = don't know
24. R_BRING	1 = yes, 2 = no, 3 = don't know



- 24.1 R\_FAIR            1 = yes, 2 = no, 3 = don't know
- 24.2 R\_NOT FAIR    open
25. R\_REPORT        1 = yes, 2 = no
26. R\_ENFORCE      1 = yes, 2 = no, 3 = don't know
27. TIME            open
28. AGE              1 = 18-25, 2 = 26-35, 3 = 36 = 45, 4 = 46-55, 5 = 56-65, 6 = 66 and above,  
7 = no response
29. INCOME           1 = \$0 to \$10,000  
                         2 = \$10,001 to \$20,000  
                         3 = \$20,001 to \$40,000  
                         4 = \$40,001 to \$70,000  
                         5 = \$70,001 to \$100,000  
                         6 = Above \$100,000  
                         7 = no response

Appendix C  
Focus Group Script  
March 1, 2001

- I. Introductions
- II. Background of Project
  - A. Why Gray's Reef
  - B. How the information will be used
- III. Consent Forms
- IV. Go over fishing intensity questions that need clarification (weed out unclear or unnecessary questions).
  - A. Is question 3 answerable?
  - B. Question 4?
  - C. What answer categories need to be added to question 4?
  - D. Question 8?
- V. Skip Species Questions section at first and come back to it if there is time.
- VI. Really work at trying to clarify the boat mode and gear section.
  - A. Solicit more possible answers regarding fishing gear (Question 19).
- VII. Regulation Questions
  - A. Try to get one person to answer the regulation question before soliciting responses from the whole group.
  - B. How familiar is the group with Federal vs. State fishing regulations?
- VIII. Skip Demographic Questions
- IX. Other
  - A. Is there often a lapse in fishing trips or are they often consistent?
  - B. Does the focus group have caller ID?
  - C. What could I say to you to keep you on the phone line?
  - D. What is the best time to call?
- X. Thank You! Hand out free NSOE mugs.

## Appendix D Survey Results

1. What type of fisherman are you?
 

Recreational	59
Both	1
  
2. During what time of year do you fish the most?
 

Winter	1
Summer	18
All Seasons	14
Spring through Fall	12
Fall and Spring	1
Spring and Summer	11
  
3. How many fishing trips did you take off of the coast of Georgia in the year 2000?  
Mean = 25.66
  
4. How many fishing trips did you take to the Gray's Reef area in the year 2000?  
Mean = 12.09
  
5. On your trips to Gray's Reef, how many hours do you usually spend on the reef?
 

1 – 3 hours	9
4 – 7 hours	39
8 – 12 hours	12
  
6. Do you tend to fish in only one location, or in several locations at Gray's Reef?
 

One	1
Several	59
  
7. Do any of the following factors influence your choice of fishing locations at Gray's Reef?
 

Weather	YES	18
	SOMEWHAT	11
	NOT AT ALL	31
Word of mouth/radio talk	YES	21
	SOMEWHAT	14
	NOT AT ALL	25
Seasonal patterns	YES	46
	SOMEWHAT	4
	NOT AT ALL	10
Captain's choice	YES	42
	SOMEWHAT	5
	NOT AT ALL	13

Fish species preference	YES	46
	SOMEWHAT	4
	NOT AT ALL	10
Time of day	YES	13
	SOMEWHAT	7
	NOT AT ALL	40
8. Why do you fish Gray's Reef?		
For food	YES	31
	NO	29
For recreation	YES	57
	NO	3
For family tradition	YES	12
	NO	48
Tournament prizes	YES	47
	NO	13
9. How many fish did you catch at Gray's Reef in the year 2000?		
Mean = 74		
10. About how many of these fish did you keep?		
Mean = 377		
11. How many fish did you catch in total for the year 2000? This is not just at Gray's Reef.		
Mean = 36		

## SPECIES QUESTIONS

12. Of **all** species, which do you catch the most frequently on Gray's Reef?  
King Mackerel
13. What are your top three target species at Gray's Reef? Rank them, most favorite species first.  
King Mackerel  
Black Sea Bass  
Other Grouper Species
14. What are some examples of your non-target catch?  
(See Appendix Table F1 for species counts)

## BOAT MODE/GEAR USE QUESTIONS

15. What type of gear do you use when fishing?
- Rod and reel (Types...fly, etc.) 60
  - Nets (Types) 2

- Spear-gun 1
- Hawaiian sling 0
- Fish-finding equipment 23
- Trolling lines (Down rigger, Outrigger) 29
- Hand lines 0
- Other (Describe) 4

16. When you go on fishing trips, which of the following methods do you usually travel by?  
For each one answer 0, 25, 50, 75, or 100%.

	0%	25%	50%	75%	100%
Private Household Boat	1	1	0	1	57
Charter Boat	57	1	0	1	1
Party Boat	60	0	0	0	0
Rental Boat	60	0	0	0	0

17. In general, how many people do you fish with on your trips to Gray's Reef?

Mean = 3.63

18. In general, how many of these people belong to a fishing group or association?

Mean = 2.59

Of these, how many belong to the Southern Kingfish Association?

Mean = 3.38

19. When fishing at Gray's Reef, how often do you use the following fishing methods? For each one answer 0, 25, 50, 75, or 100%.

	0%	25%	50%	75%	100%
Troll	1	1	8	20	30
Anchor	45	15	0	0	0
Drift	36	21	3	0	0
Other	59	0	1	0	0

20. Do you ever SCUBA dive at Gray's Reef? (*if no, proceed to question 20*)

Yes = 8, no = 51

If so, about how many times per year?

Mean = 7.13

Do you spearfish when SCUBA diving?

Yes = 4, no = 4

## REGULATION QUESTIONS

21. How would you rank your familiarity with the fishing rules and regulations in place at Gray's Reef?
- a. Very familiar 31
  - b. Somewhat familiar 26
  - c. Not at all familiar 3
22. How did you learn about the regulations?
- a. Read about in publications 44
  - b. Heard from boat captain 8
  - c. From other fishermen 18
  - d. Tackle shop 5
  - e. Internet 7
  - f. Other (describe) 5
23. Do you bring a copy of the Gray's Reef regulations with you on the boat?
- a. Yes 18
  - b. No 40
  - c. Don't know 1
24. Do you bring a copy of general fishing regulations with you on the boat?
- a. Yes 37
  - b. No 23
25. Do you think the sanctuary regulations are fair?
- a. Yes 49
  - b. No 4
  - c. Don't know 7
26. Would you report someone in violation of the regulations?
- a. Yes 46
  - b. No 9
  - c. Don't know 0
  - d. Depends 4
27. Do you think there should be more/less/no change in enforcement of the regulations?
- a. More 21
  - b. Less 2
  - c. No Change 33
  - d. Depends 2

## DEMOGRAPHIC QUESTIONS

28. How many years have you been fishing the Gray's Reef area?

Mean = 11.58

29. Which of the following categories best describes your age?

- a. 18 – 25            4
- b. 26 – 35            20
- c. 36 – 45            18
- d. 46 – 55            11
- e. 56 – 65            6
- f. 66 and above    1

30. Which category best describes the annual income of your household?

- a. \$0 to \$10,000            0
- b. \$10,001 to \$20,000       0
- c. \$20,001 to \$40,000       3
- d. \$40,001 to \$70,000       23
- e. \$70,001 to \$100,000      17
- f. Above \$100,000           13



## Appendix E

### Additional Comments

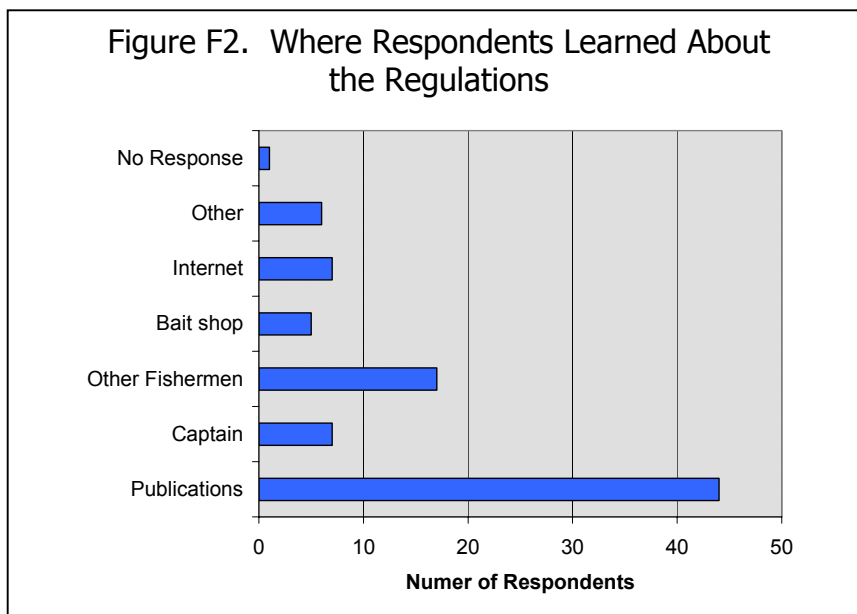
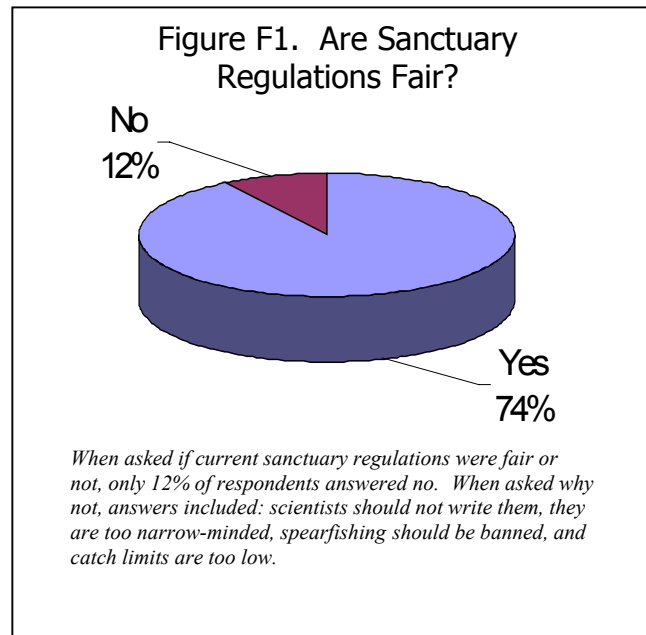
#### Responses to Question 31

- Should change regulations to stop anchoring, don't close the reef to fishing...95-99% of the fishers fish for migratory fish and don't harm the reef
- Trolling should not be eliminated, there should be tougher regulations on bottom fishing, there should be regulations to prohibit anchoring, don't close the reef to fishing or if anything to traveling through to farther locations
- More studies need to be done, but need to be realistic. Not by people at a desk who have never been to the reef. Make it difficult to be involved -last minute meetings, out of the way locations. Need to do dive studies. Don't think there should be commercial fishing on the reef.
- Recreational fishermen aren't hurting the fisheries, the problem is commercial fishermen.
- I've only seen the coast guard there once in 5 years. Enforce what you got.
- Don't close the sanctuary as it is the only close and accessible live-bottom around.
- The reef needs to stay open to the public and recreational fishing. Perhaps creel limits can be restricted but there should not be any closure. Close the sanctuary to tournament fishing (competitions) as it is detrimental to the King Mackerel populations. It [tournaments] exist only for sponsors and not people. Look more closely at commercial fishing activities.
- People should understand how much of a treasure the reef is. Never seen an enforcement officer at the reef. Info that went out to fishermen was half-assed. There needs to be better dissemination of information. Hope that people who use the reef know how important it is to look after it. Abuse it you lose it.
- Should close the area during grouper spawning season like they do on the Gulf coast.
- I caught a kingfish on Dec 3 2000 water temp 65deg, don't see how trolling can hurt reef, fish come right up to boat, no anchoring rule is OK, no reason for closing, enough law enforcement (borders on "harassment"), biggest fish I caught was 40 inch kingfish on Gray's, 3/4 of people out there are fishing Mackerel.
- Should change the commercial fishing regulations.
- There needs to be more structure on the reef for fish to hide, breed, etc.
- Don't close the reef, it is ranked as one of the top ten most popular fishing locations.
- Should build more habitat, there are more kingfish now than in the past 15 years so things are going well.
- Gray's Reef was in good shape when the DNR had control, doesn't think there are problems with the reef, those abusing the regulations need to be prosecuted.
- Not many days that people can fish out there so they shouldn't close the reef.
- Would hate to see it closed, more enforcement because it's a large area, could make a section a sanctuary off limits to all fishing but not the whole thing.
- Only place fairly close that is good for bottom fishing.

- Don't see any enforcement now, but more enforcement of regulations wouldn't help. More important to have concerned citizens. Don't want to see it closed. Should keep the commercial fishermen out (although hasn't seen any out there).
- Shouldn't anchor on the reef.
- Regulations are important. The sanctuary should regulate anchoring and enforcement should be increased.
- Market the reef better. You don't know if you're in the sanctuary if you aren't really familiar with the area.
- The Government should be careful with what they regulate. Perhaps a State tax on fish landings should be implemented. Preserve the resource without killing the recreational angler.
- Leave it open for everyone while protecting it.
- Leave the sanctuary as it is. Stop people from anchoring in the sanctuary. Have seen commercial boats in the sanctuary.
- There isn't any damage from trolling.
- Georgia's best fishing! Don't close it!
- Divers and non-tournament recreational fishers impact reef more than tournament fishers, should focus on divers and non-tournament fishermen.
- Hate to see them close it, want more enforcement.
- Problems not because of SKA: we don't anchor.
- The number of recreational fishermen can't possibly affect the reef, commercial fishermen are the problem, I only see 4-5 recreational boats on the reef at a time (on weekends).
- Used to see longliners & bottom traps, but not in last 10 years, should keep it open for sportfishing, make restrictions in order to sustain the fishery, "I'm all for limits", teach people how to release fish!
- Hope they don't close it to rec. fishing, should make offlimits to commercial fishing.
- Keep the divers out.
- Don't close the reef, take away the no anchoring rule.

## Appendix F

### Additional Figures



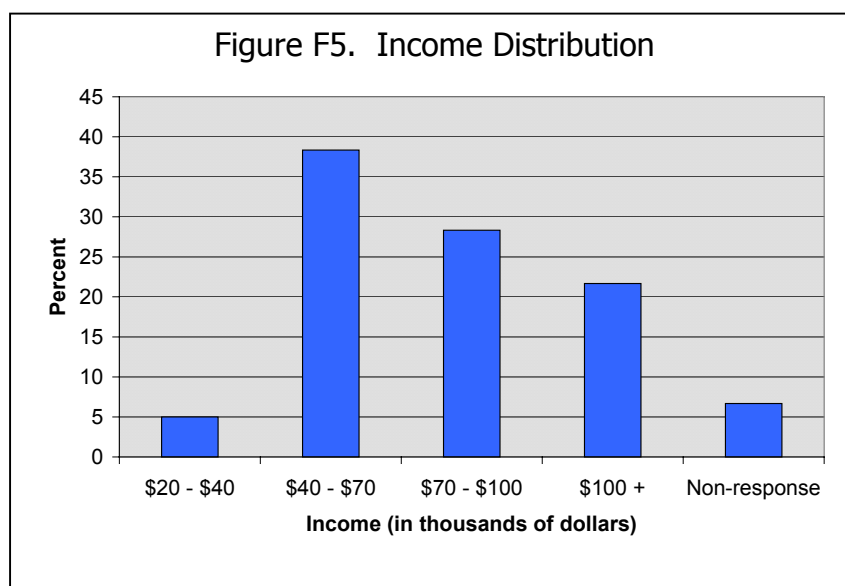
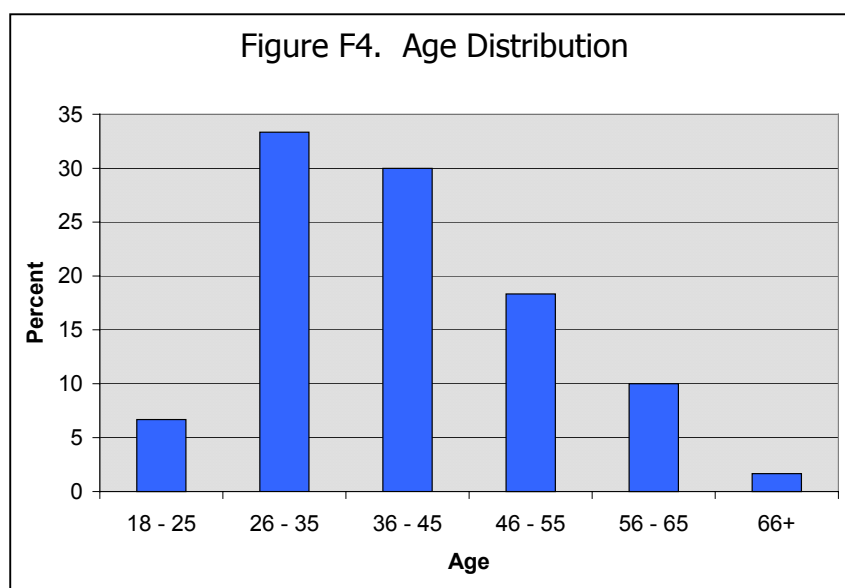
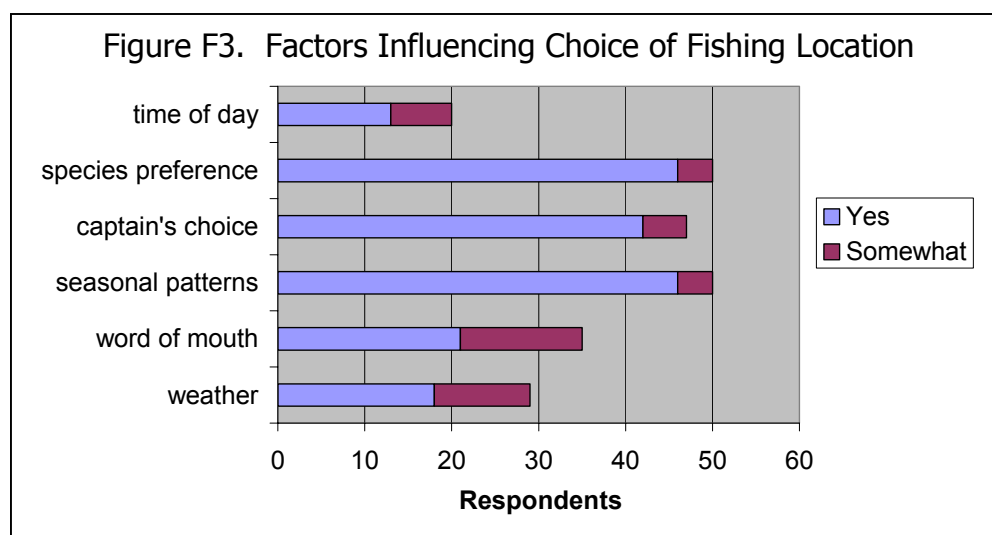


Figure F6. Reasons for Fishing Gray's Reef

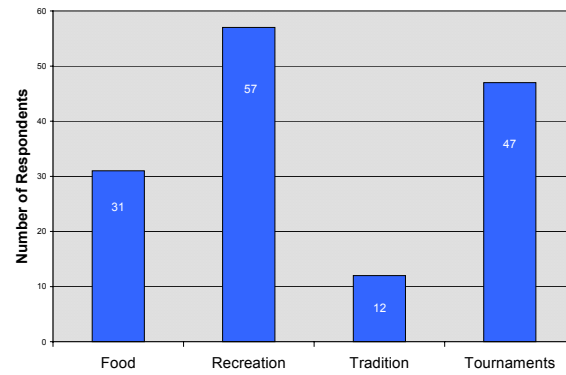


Figure F7. Years Fishing on Gray's Reef

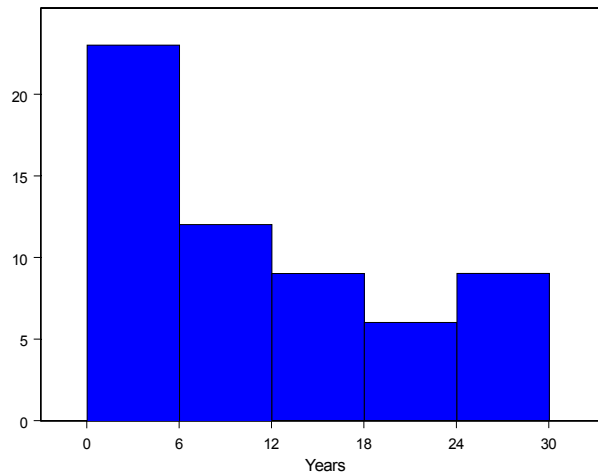


Figure F8. Fishing Gear

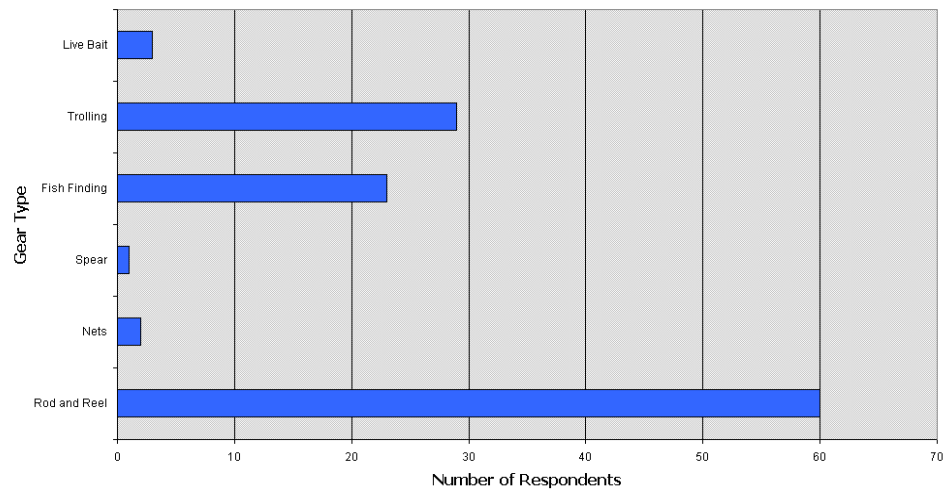


Table F1: Non-Target Species Caught on Gray's Reef

<b>Species</b>	<b>Count*</b>
Amberjack	12
Barracuda	45
Black Sea Bass	3
Blackfin Tuna	2
Blowfish	1
Bonita	5
Cobia	4
Dolphin-fish	4
Flounder	1
Grouper	3
Jack Crevalle	2
Jacks	1
Pinfish	1
Porgies	1
Red Snapper	1
Remora	1
Sailfish	6
Sergeant Major	1
Shark	26
Snapper	4
Spanish Mackerel	6
Squirrelfish	1
Triggerfish	4
Tuna	4
Vermilion Snapper	1
Wahoo	1
Warsaw Grouper	1
White Suckerfish	1

\*Count represents the number of respondents that named the species as an example of their non-target catch.

Table F2. Chi-Squared Test  
*Age vs. Opinion on Regulation Enforcement*

Age 1 = 18 – 35

Age 2 = 36 +

Enf 1 = Respondent felt there should be more enforcement of Gray's Reef regulations

Enf 3 = Respondent felt that current levels of enforcement are sufficient

p = 0.5505254; There is no significant difference in opinions on regulation enforcement between young (18-35) and older (35+) respondents.

```
crosstabs(formula = ~ ENF.CNT + AGE.CNT, data = SDF6, na.action = na.fail,
           drop.unused.levels = T)
```

```
ENF.CNT|AGE.CNT
      |1      |2      |RowTotl|
-----+-----+-----+-----+
1      | 5      |10      |15      |
      |0.33    |0.67    |0.31    |
      |0.26    |0.34    |         |
      |0.10    |0.21    |         |
-----+-----+-----+-----+
3      |14      |19      |33      |
      |0.42    |0.58    |0.69    |
      |0.74    |0.66    |         |
      |0.29    |0.40    |         |
-----+-----+-----+-----+
ColTotl|19      |29      |48      |
      |0.4      |0.6      |         |
-----+-----+-----+-----+
Test for independence of all factors
      Chi^2 = 0.3563768 d.f.= 1 (p=0.5505254)
      Yates' correction not used
```